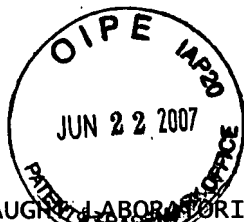


ATTACHMENT A
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SEQUENCE LISTING

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SASAKI, Ken
YANG, Yan-Ping
KLEIN, Michel H.

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<141> 2002-10-04

<150> US 09/361,619

<151> 1999-07-27

<150> PCT/CA00/00870

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atcagtaatg	tgggcaaagg	cacaaaagat	accgacgctg	ccaatgtaca	acagttaa	4680
gaagtacgca	acttggtggg	tcttggtaat	gctggtaatg	ataacgctga	cggcaatcag	4740
gtaaaccattg	ccgacatcaa	aaaagaccca	aattcagggt	catcatctaa	ccgactgtc	4800
atcaaagcag	gcacgggtact	tggcggtaaa	ggtaataacg	ataccgaaaa	acttgccact	4860
gggtggtatc	aagtgggcgt	ggataaagac	ggcaacgcta	acggcgattt	aagcaatggt	4920
tgggtcaaaa	cccaaaaaga	tggcagcaaa	aaagccctgc	tcgccactta	taacgccgca	4980
ggtcagacca	actatttgac	caacaacccc	gcagaagcca	ttgacagaat	aatgaacaa	5040
ggtatccgct	tcttccatgt	caacgatggc	aatcaagagc	ctgtggtaca	agggcgtaac	5100
ggcattgact	caagtgcctc	aggcaagcac	tcagtggcga	taggtttcca	ggccaaggca	5160
gatgggtgaag	ccgccgttgc	cataggcaga	caaaccgaag	caggcaacca	atccatcgcc	5220
atcgggtgata	acgcacaagc	cacgggcgat	caatccatcg	ccatcggtac	aggcaatgtg	5280
gtagcaggta	agcactctgg	tgccatcggc	gaccaagca	ctgttaaggc	tgataacagt	5340
tacagtgtgg	gtaataacaa	ccagtttacc	gatgccactc	aaaccgatgt	ctttggtgtg	5400
ggcaataaca	tcaccgtgac	cgaaagtaac	tcggttgcc	taggttcaaa	ctctgccatc	5460
agtgcaggca	cacacgcagg	cacacaagcc	aaaaaatctg	acggcacagc	aggtacaacc	5520
accacagcag	gtgcaaccgg	tacggttaaa	ggctttgctg	gacaaacggc	ggttgggtgcg	5580
gtctccgtgg	tgctgcacgc	tgatgcacgc	cgtatccaaa	atgtggcagc	aggtgaggtc	5640
agtgccacca	gcaccgatgc	ggtcaatggt	agccagttgt	acaaagccac	ccaaagcatt	5700
gccaacgcaa	ccaatgagct	tgaccatcgt	atccaccaa	acgaaaataa	ggccaatgca	5760
gggatttcat	cagcgatggc	gatggcgctc	atgccacaag	cctacattcc	tggcagatcc	5820
atggttaccg	ggggtattgc	caccacaa	ggtcaagggtg	cgggtggcagt	gggactgtcg	5880
aagctgtcgg	ataatggtca	atgggtattt	aaaatcaatg	gttcagccga	tacccaaggc	5940
catgtagggg	cggcagttgg	tgcaggtttt	cacttt			5976

<211> 1992
<212> PRT
<213> Moraxella catarrhalis

<400> 3

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35 40 45
Asn Ala Gln Gly Gly Gln Ala Ile Ala Ile Gly Ser Ser Asn Lys Thr
50 55 60
Val Asn Gly Ser Ser Leu Asp Lys Ile Gly Thr Asp Ala Thr Gly Gln
65 70 75 80
Glu Ser Ile Ala Ile Gly Gly Asp Val Lys Ala Ser Gly Asp Ala Ser
85 90 95
Ile Ala Ile Gly Ser Asp Asp Leu His Leu Leu Asp Gln His Gly Asn
100 105 110
Pro Lys His Pro Lys Gly Thr Leu Ile Asn Asp Leu Ile Asn Gly His
115 120 125
Ala Val Leu Lys Glu Ile Arg Ser Ser Lys Asp Asn Asp Val Lys Tyr
130 135 140
Arg Arg Thr Thr Ala Ser Gly His Ala Ser Thr Ala Val Gly Ala Met
145 150 155 160
Ser Tyr Ala Gln Gly His Phe Ser Asn Ala Phe Gly Thr Arg Ala Thr
165 170 175
Ala Lys Ser Ala Tyr Ser Leu Ala Val Gly Leu Ala Ala Thr Ala Glu
180 185 190
Gly Gln Ser Thr Ile Ala Ile Gly Ser Asp Ala Thr Ser Ser Ser Leu
195 200 205
Gly Ala Ile Ala Leu Gly Ala Gly Thr Arg Ala Gln Leu Gln Gly Ser
210 215 220
Ile Ala Leu Gly Gln Gly Ser Val Val Thr Gln Ser Asp Asn Asn Ser
225 230 235 240
Arg Pro Ala Tyr Thr Pro Asn Thr Gln Ala Leu Asp Pro Lys Phe Gln
245 250 255
Ala Thr Asn Asn Thr Lys Ala Gly Pro Leu Ser Ile Gly Ser Asn Ser
260 265 270
Ile Lys Arg Lys Ile Ile Asn Val Gly Ala Gly Val Asn Lys Thr Asp
275 280 285
Ala Val Asn Val Ala Gln Leu Glu Ala Val Val Lys Trp Ala Lys Glu
290 295 300
Arg Arg Ile Thr Phe Gln Gly Asp Asp Asn Ser Thr Asp Val Lys Ile
305 310 315 320

Gly Leu Asp Asn Thr Leu Thr Ile Lys Gly Gly Ala Glu Thr Asn Ala
 325 330 335
 Leu Thr Asp Asn Asn Ile Gly Val Val Lys Glu Ala Asp Asn Ser Gly
 340 345 350
 Leu Lys Val Lys Leu Ala Lys Thr Leu Asn Asn Leu Thr Glu Val Asn
 355 360 365
 Thr Thr Thr Leu Asn Ala Thr Thr Thr Val Lys Val Gly Ser Ser Ser
 370 375 380
 Ser Thr Thr Ala Glu Leu Leu Ser Asp Ser Leu Thr Phe Thr Gln Pro
 385 390 395 400
 Asn Thr Gly Ser Gln Ser Thr Ser Lys Thr Val Tyr Gly Val Asn Gly
 405 410 415
 Val Lys Phe Thr Asn Asn Ala Glu Thr Thr Ala Ala Ile Gly Thr Thr
 420 425 430
 Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Arg Asp Gly Asp Val Asp
 435 440 445
 Glu Lys Gln Ala Pro Tyr Leu Asp Lys Lys Gln Leu Lys Val Gly Ser
 450 455 460
 Val Ala Ile Thr Ile Asp Asn Gly Ile Asp Ala Gly Asn Lys Lys Ile
 465 470 475 480
 Ser Asn Leu Ala Lys Gly Ser Ser Ala Asn Asp Ala Val Thr Ile Glu
 485 490 495
 Gln Leu Lys Ala Ala Lys Pro Thr Leu Asn Ala Gly Ala Gly Ile Ser
 500 505 510
 Val Thr Pro Thr Glu Ile Ser Val Asp Ala Lys Ser Gly Asn Val Thr
 515 520 525
 Ala Pro Thr Tyr Asn Ile Gly Val Lys Thr Thr Glu Leu Asn Ser Asp
 530 535 540
 Gly Thr Ser Asp Lys Phe Ser Val Lys Gly Ser Gly Thr Asn Asn Ser
 545 550 555 560
 Leu Val Thr Ala Glu His Leu Ala Ser Tyr Leu Asn Glu Val Asn Arg
 565 570 575
 Thr Ala Asp Ser Ala Leu Gln Ser Phe Thr Val Lys Glu Glu Asp Asp
 580 585 590
 Asp Asp Ala Asn Ala Ile Thr Val Ala Lys Asp Thr Thr Lys Asn Ala
 595 600 605
 Gly Ala Val Ser Ile Leu Lys Leu Lys Gly Lys Asn Gly Leu Thr Val
 610 615 620
 Ala Thr Lys Lys Asp Gly Thr Val Thr Phe Gly Leu Ser Gln Asp Ser
 625 630 635 640
 Gly Leu Thr Ile Gly Lys Ser Thr Leu Asn Asn Asp Gly Leu Thr Val
 645 650 655
 Lys Asp Thr Asn Glu Gln Ile Gln Val Gly Ala Asn Gly Ile Lys Phe
 660 665 670

Thr Asn Val Asn Gly Ser Asn Pro Gly Thr Gly Ile Ala Asn Thr Ala
 675 680 685
 Arg Ile Thr Arg Asp Lys Ile Gly Phe Ala Gly Ser Asp Gly Ala Val
 690 695 700
 Asp Thr Asn Lys Pro Tyr Leu Asp Gln Asp Lys Leu Gln Val Gly Asn
 705 710 715 720
 Val Lys Ile Thr Asn Thr Gly Ile Asn Ala Gly Gly Lys Ala Ile Thr
 725 730 735
 Gly Leu Ser Pro Thr Leu Pro Ser Ile Ala Asp Gln Ser Ser Arg Asn
 740 745 750
 Ile Glu Leu Gly Asn Thr Ile Gln Asp Lys Asp Lys Ser Asn Ala Ala
 755 760 765
 Ser Ile Asn Asp Ile Leu Asn Thr Gly Phe Asn Leu Lys Asn Asn Asn
 770 775 780
 Asn Pro Ile Asp Phe Val Ser Thr Tyr Asp Ile Val Asp Phe Ala Asn
 785 790 795 800
 Gly Asn Ala Thr Thr Ala Thr Val Thr His Asp Thr Ala Asn Lys Thr
 805 810 815
 Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile His Leu
 820 825 830
 Thr Gly Thr Asp Asp Asn Lys Lys Leu Gly Val Lys Thr Thr Lys Leu
 835 840 845
 Asn Lys Thr Ser Ala Asn Gly Asn Thr Ala Thr Asn Phe Asn Val Asn
 850 855 860
 Ser Ser Asp Glu Asp Ala Leu Val Asn Ala Lys Asp Ile Ala Glu Asn
 865 870 875 880
 Leu Asn Thr Leu Ala Lys Glu Ile His Thr Thr Lys Gly Thr Ala Asp
 885 890 895
 Thr Ala Leu Gln Thr Phe Thr Val Lys Lys Val Asp Glu Asn Asn Asn
 900 905 910
 Ala Asp Asp Ala Asn Ala Ile Thr Val Gly Gln Lys Asn Ala Asn Asn
 915 920 925
 Gln Val Asn Thr Leu Thr Leu Lys Gly Glu Asn Gly Leu Asn Ile Lys
 930 935 940
 Thr Asp Lys Asn Gly Thr Val Thr Phe Gly Ile Asn Thr Thr Ser Gly
 945 950 955 960
 Leu Lys Ala Gly Lys Ser Thr Leu Asn Asp Gly Gly Leu Ser Ile Lys
 965 970 975
 Asn Pro Thr Gly Ser Glu Gln Ile Gln Val Gly Ala Asp Gly Val Lys
 980 985 990
 Phe Ala Lys Val Asn Asn Asn Gly Val Val Gly Ala Gly Ile Asp Gly
 995 1000 1005
 Thr Thr Arg Ile Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly

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Ser Leu Asp Lys Ser Lys 1025	Pro His Leu Ser Lys 1030	Asp Gly Ile Asn Ala 1035 1040
Gly Gly Lys Lys Ile Thr 1045	Asn Ile Gln Ser Gly Glu 1050	Ile Ala Gln Asn 1055
Ser His Asp Ala Val Thr 1060	Gly Gly Lys Ile Tyr 1065	Asp Leu Lys Thr Glu 1070
Leu Glu Asn Lys Ile Ser Ser 1075	Thr Ala Lys Thr Ala 1080	Gln Asn Ser Leu 1085
His Glu Phe Ser Val Ala 1090	Asp Glu Gln Gly Asn 1095	Asn Phe Thr Val Ser 1100
Asn Pro Tyr Ser Ser Tyr 1105	Asp Thr Ser Lys Thr 1110	Ser Asp Val Ile Thr 1115 1120
Phe Ala Gly Glu Asn Gly 1125	Ile Thr Thr Lys Val 1130	Asn Lys Gly Val Val 1135
Arg Val Gly Ile Asp Gln 1140	Thr Lys Gly Leu Thr 1145	Thr Pro Lys Leu Thr 1150
Val Gly Asn Asn Asn Gly 1155	Lys Gly Ile Val Ile 1160	Asp Ser Gln Asn Gly 1165
Gln Asn Thr Ile Thr Gly 1170	Leu Ser Asn Thr Leu 1175	Ala Asn Val Thr Asn 1180
Asp Lys Gly Ser Val Arg 1185	Thr Thr Glu Gln Gly 1190	Asn Ile Ile Lys Asp 1195 1200
Glu Asp Lys Thr Arg Ala 1205	Ala Ser Ile Val Asp 1210	Val Leu Ser Ala Gly 1215
Phe Asn Leu Gln Gly Asn 1220	Gly Glu Ala Val Asp 1225	Phe Val Ser Thr Tyr 1230
Asp Thr Val Asn Phe Ala 1235	Asp Gly Asn Ala Thr 1240	Thr Thr Ala Lys Val Thr 1245
Tyr Asp Asp Thr Ser Lys 1250	Thr Ser Lys Val Val 1255	Tyr Asp Val Asn Val 1260
Asp Asp Thr Thr Ile Glu 1265	Val Lys Asp Lys Lys 1270	Leu Gly Val Lys Thr 1275 1280
Thr Thr Leu Thr Ser Thr 1285	Gly Thr Gly Ala Asn 1290	Lys Phe Ala Leu Ser 1295
Asn Gln Ala Thr Gly Asp 1300	Ala Leu Val Lys Ala 1305	Ser Asp Ile Val Ala 1310
His Leu Asn Thr Leu Ser 1315	Gly Asp Ile Gln Thr 1320	Ala Lys Gly Ala Ser 1325
Gln Ala Asn Asn Ser Ala 1330	Gly Tyr Val Asp Ala 1335	Asp Gly Asn Lys Val 1340
Ile Tyr Asp Ser Thr Asp 1345	Asn Lys Tyr Tyr Gln 1350	Ala Lys Asn Asp Gly 1355 1360

Thr Val Asp Lys Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln
 1365 1370 1375
 Ala Gln Thr Pro Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val
 1380 1385 1390
 Ile Asn Lys Glu Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn
 1395 1400 1405
 Glu Asp Asn Ala Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn
 1410 1415 1420
 Lys Thr Lys Asn Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala
 1425 1430 1435 1440
 Gln Thr Pro Leu Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys
 1445 1450 1455
 Leu Gly Glu Thr Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys
 1460 1465 1470
 Leu Thr Asp Asn Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr
 1475 1480 1485
 Val Lys Leu Ala Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly
 1490 1495 1500
 Gly Thr Lys Ile Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly
 1505 1510 1515 1520
 Gln Ala Lys Ala Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu
 1525 1530 1535
 Gly Gly Lys Val Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp
 1540 1545 1550
 Ala Ala Asn Val Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu
 1555 1560 1565
 Gly Asn Ala Gly Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala
 1570 1575 1580
 Asp Ile Lys Lys Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val
 1585 1590 1595 1600
 Ile Lys Ala Gly Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu
 1605 1610 1615
 Lys Leu Ala Thr Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn
 1620 1625 1630
 Ala Asn Gly Asp Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly
 1635 1640 1645
 Ser Lys Lys Ala Leu Leu Ala Thr Tyr Asn Ala Ala Gly Gln Thr Asn
 1650 1655 1660
 Tyr Leu Thr Asn Asn Pro Ala Glu Ala Ile Asp Arg Ile Asn Glu Gln
 1665 1670 1675 1680
 Gly Ile Arg Phe Phe His Val Asn Asp Gly Asn Gln Glu Pro Val Val
 1685 1690 1695
 Gln Gly Arg Asn Gly Ile Asp Ser Ser Ala Ser Gly Lys His Ser Val
 1700 1705 1710

Ala Ile Gly Phe Gln Ala Lys Ala Asp Gly Glu Ala Ala Val Ala Ile
 1715 1720 1725
 Gly Arg Gln Thr Gln Ala Gly Asn Gln Ser Ile Ala Ile Gly Asp Asn
 1730 1735 1740
 Ala Gln Ala Thr Gly Asp Gln Ser Ile Ala Ile Gly Thr Gly Asn Val
 1745 1750 1755 1760
 Val Ala Gly Lys His Ser Gly Ala Ile Gly Asp Pro Ser Thr Val Lys
 1765 1770 1775
 Ala Asp Asn Ser Tyr Ser Val Gly Asn Asn Asn Gln Phe Thr Asp Ala
 1780 1785 1790
 Thr Gln Thr Asp Val Phe Gly Val Gly Asn Asn Ile Thr Val Thr Glu
 1795 1800 1805
 Ser Asn Ser Val Ala Leu Gly Ser Asn Ser Ala Ile Ser Ala Gly Thr
 1810 1815 1820
 His Ala Gly Thr Gln Ala Lys Lys Ser Asp Gly Thr Ala Gly Thr Thr
 1825 1830 1835 1840
 Thr Thr Ala Gly Ala Thr Gly Thr Val Lys Gly Phe Ala Gly Gln Thr
 1845 1850 1855
 Ala Val Gly Ala Val Ser Val Gly Ala Ser Gly Ala Glu Arg Arg Ile
 1860 1865 1870
 Gln Asn Val Ala Ala Gly Glu Val Ser Ala Thr Ser Thr Asp Ala Val
 1875 1880 1885
 Asn Gly Ser Gln Leu Tyr Lys Ala Thr Gln Ser Ile Ala Asn Ala Thr
 1890 1895 1900
 Asn Glu Leu Asp His Arg Ile His Gln Asn Glu Asn Lys Ala Asn Ala
 1905 1910 1915 1920
 Gly Ile Ser Ser Ala Met Ala Met Ala Ser Met Pro Gln Ala Tyr Ile
 1925 1930 1935
 Pro Gly Arg Ser Met Val Thr Gly Gly Ile Ala Thr His Asn Gly Gln
 1940 1945 1950
 Gly Ala Val Ala Val Gly Leu Ser Lys Leu Ser Asp Asn Gly Gln Trp
 1955 1960 1965
 Val Phe Lys Ile Asn Gly Ser Ala Asp Thr Gln Gly His Val Gly Ala
 1970 1975 1980
 Ala Val Gly Ala Gly Phe His Phe
 1985 1990

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 <211> 2047
 <212> PRT
 <213> Moraxella catarrhalis

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 Cys Ala Thr Gly Gln Val Gly Ser Val Cys Thr Leu Ser Phe Ala Arg
 35 40 45
 Ile Ala Ala Leu Ala Val Leu Val Ile Gly Ala Thr Leu Ser Gly Ser
 50 55 60
 Ala Tyr Ala Gln Lys Lys Asp Thr Lys His Ile Ala Ile Gly Glu Gln
 65 70 75 80
 Asn Gln Pro Arg Arg Ser Gly Thr Ala Lys Ala Asp Gly Asp Arg Ala
 85 90 95
 Ile Ala Ile Gly Glu Asn Ala Asn Ala Gln Gly Gly Gln Ala Ile Ala
 100 105 110
 Ile Gly Ser Ser Asn Lys Thr Val Asn Gly Ser Ser Leu Asp Lys Ile
 115 120 125
 Gly Thr Asp Ala Thr Gly Gln Glu Ser Ile Ala Ile Gly Gly Asp Val
 130 135 140
 Lys Ala Ser Gly Asp Ala Ser Ile Ala Ile Gly Ser Asp Asp Leu His
 145 150 155 160
 Leu Leu Asp Gln His Gly Asn Pro Lys His Pro Lys Gly Thr Leu Ile
 165 170 175
 Asn Asp Leu Ile Asn Gly His Ala Val Leu Lys Glu Ile Arg Ser Ser
 180 185 190
 Lys Asp Asn Asp Val Lys Tyr Arg Arg Thr Thr Ala Ser Gly His Ala
 195 200 205
 Ser Thr Ala Val Gly Ala Met Ser Tyr Ala Gln Gly His Phe Ser Asn
 210 215 220
 Ala Phe Gly Thr Arg Ala Thr Ala Lys Ser Ala Tyr Ser Leu Ala Val
 225 230 235 240
 Gly Leu Ala Ala Thr Ala Glu Gly Gln Ser Thr Ile Ala Ile Gly Ser
 245 250 255
 Asp Ala Thr Ser Ser Ser Leu Gly Ala Ile Ala Leu Gly Ala Gly Thr
 260 265 270
 Arg Ala Gln Leu Gln Gly Ser Ile Ala Leu Gly Gln Gly Ser Val Val
 275 280 285
 Thr Gln Ser Asp Asn Asn Ser Arg Pro Ala Tyr Thr Pro Asn Thr Gln
 290 295 300
 Ala Leu Asp Pro Lys Phe Gln Ala Thr Asn Asn Thr Lys Ala Gly Pro
 305 310 315 320
 Leu Ser Ile Gly Ser Asn Ser Ile Lys Arg Lys Ile Ile Asn Val Gly
 325 330 335
 Ala Gly Val Asn Lys Thr Asp Ala Val Asn Val Ala Gln Leu Glu Ala
 340 345 350
 Val Val Lys Trp Ala Lys Glu Arg Arg Ile Thr Phe Gln Gly Asp Asp
 355 360 365

Asn Ser Thr Asp Val Lys Ile Gly Leu Asp Asn Thr Leu Thr Ile Lys
 370 375 380
 Gly Gly Ala Glu Thr Asn Ala Leu Thr Asp Asn Asn Ile Gly Val Val
 385 390 395 400
 Lys Glu Ala Asp Asn Ser Gly Leu Lys Val Lys Leu Ala Lys Thr Leu
 405 410 415
 Asn Asn Leu Thr Glu Val Asn Thr Thr Thr Leu Asn Ala Thr Thr Thr
 420 425 430
 Val Lys Val Gly Ser Ser Ser Ser Thr Thr Ala Glu Leu Leu Ser Asp
 435 440 445
 Ser Leu Thr Phe Thr Gln Pro Asn Thr Gly Ser Gln Ser Thr Ser Lys
 450 455 460
 Thr Val Tyr Gly Val Asn Gly Val Lys Phe Thr Asn Asn Ala Glu Thr
 465 470 475 480
 Thr Ala Ala Ile Gly Thr Thr Arg Ile Thr Arg Asp Lys Ile Gly Phe
 485 490 495
 Ala Arg Asp Gly Asp Val Asp Glu Lys Gln Ala Pro Tyr Leu Asp Lys
 500 505 510
 Lys Gln Leu Lys Val Gly Ser Val Ala Ile Thr Ile Asp Asn Gly Ile
 515 520 525
 Asp Ala Gly Asn Lys Lys Ile Ser Asn Leu Ala Lys Gly Ser Ser Ala
 530 535 540
 Asn Asp Ala Val Thr Ile Glu Gln Leu Lys Ala Ala Lys Pro Thr Leu
 545 550 555 560
 Asn Ala Gly Ala Gly Ile Ser Val Thr Pro Thr Glu Ile Ser Val Asp
 565 570 575
 Ala Lys Ser Gly Asn Val Thr Ala Pro Thr Tyr Asn Ile Gly Val Lys
 580 585 590
 Thr Thr Glu Leu Asn Ser Asp Gly Thr Ser Asp Lys Phe Ser Val Lys
 595 600 605
 Gly Ser Gly Thr Asn Asn Ser Leu Val Thr Ala Glu His Leu Ala Ser
 610 615 620
 Tyr Leu Asn Glu Val Asn Arg Thr Ala Asp Ser Ala Leu Gln Ser Phe
 625 630 635 640
 Thr Val Lys Glu Glu Asp Asp Asp Asp Ala Asn Ala Ile Thr Val Ala
 645 650 655
 Lys Asp Thr Thr Lys Asn Ala Gly Ala Val Ser Ile Leu Lys Leu Lys
 660 665 670
 Gly Lys Asn Gly Leu Thr Val Ala Thr Lys Lys Asp Gly Thr Val Thr
 675 680 685
 Phe Gly Leu Ser Gln Asp Ser Gly Leu Thr Ile Gly Lys Ser Thr Leu
 690 695 700
 Asn Asn Asp Gly Leu Thr Val Lys Asp Thr Asn Glu Gln Ile Gln Val

705		710		715		720
Gly Ala Asn Gly	Ile Lys Phe Thr Asn Val	Asn Gly Ser Asn Pro Gly				
	725		730			735
Thr Gly Ile Ala	Asn Thr Ala Arg Ile Thr Arg Asp Lys Ile Gly Phe					
	740		745			750
Ala Gly Ser Asp Gly Ala Val Asp Thr Asn Lys Pro Tyr Leu Asp Gln			760			765
	755					
Asp Lys Leu Gln Val Gly Asn Val Lys Ile Thr Asn Thr Gly Ile Asn			775			780
	770					
Ala Gly Gly Lys Ala Ile Thr Gly Leu Ser Pro Thr Leu Pro Ser Ile			790			800
	785				795	
Ala Asp Gln Ser Ser Arg Asn Ile Glu Leu Gly Asn Thr Ile Gln Asp			810			815
	805					
Lys Asp Lys Ser Asn Ala Ala Ser Ile Asn Asp Ile Leu Asn Thr Gly			825			830
	820					
Phe Asn Leu Lys Asn Asn Asn Asn Pro Ile Asp Phe Val Ser Thr Tyr			840			845
	835					
Asp Ile Val Asp Phe Ala Asn Gly Asn Ala Thr Thr Ala Thr Val Thr			855			860
	850					
His Asp Thr Ala Asn Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val			870			880
	865				875	
Asp Asp Thr Thr Ile His Leu Thr Gly Thr Asp Asp Asn Lys Lys Leu			885			890
						895
Gly Val Lys Thr Thr Lys Leu Asn Lys Thr Ser Ala Asn Gly Asn Thr			900			910
Ala Thr Asn Phe Asn Val Asn Ser Ser Asp Glu Asp Ala Leu Val Asn			915			920
						925
Ala Lys Asp Ile Ala Glu Asn Leu Asn Thr Leu Ala Lys Glu Ile His			930			935
						940
Thr Thr Lys Gly Thr Ala Asp Thr Ala Leu Gln Thr Phe Thr Val Lys			945			950
						955
Lys Val Asp Glu Asn Asn Ala Asp Asp Ala Asn Ala Ile Thr Val			965			970
						975
Gly Gln Lys Asn Ala Asn Asn Gln Val Asn Thr Leu Thr Leu Lys Gly			980			985
						990
Glu Asn Gly Leu Asn Ile Lys Thr Asp Lys Asn Gly Thr Val Thr Phe			995			1000
						1005
Gly Ile Asn Thr Thr Ser Gly Leu Lys Ala Gly Lys Ser Thr Leu Asn			1010			1015
						1020
Asp Gly Gly Leu Ser Ile Lys Asn Pro Thr Gly Ser Glu Gln Ile Gln			1025			1030
						1035
Val Gly Ala Asp Gly Val Lys Phe Ala Lys Val Asn Asn Asn Gly Val			1045			1050
						1055

Val Gly Ala Gly Ile Asp Gly Thr Thr Arg Ile Thr Arg Asp Glu Ile
 1060 1065 1070
 Gly Phe Thr Gly Thr Asn Gly Ser Leu Asp Lys Ser Lys Pro His Leu
 1075 1080 1085
 Ser Lys Asp Gly Ile Asn Ala Gly Gly Lys Lys Ile Thr Asn Ile Gln
 1090 1095 1100
 Ser Gly Glu Ile Ala Gln Asn Ser His Asp Ala Val Thr Gly Gly Lys
 1105 1110 1115 1120
 Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn Lys Ile Ser Ser Thr Ala
 1125 1130 1135
 Lys Thr Ala Gln Asn Ser Leu His Glu Phe Ser Val Ala Asp Glu Gln
 1140 1145 1150
 Gly Asn Asn Phe Thr Val Ser Asn Pro Tyr Ser Ser Tyr Asp Thr Ser
 1155 1160 1165
 Lys Thr Ser Asp Val Ile Thr Phe Ala Gly Glu Asn Gly Ile Thr Thr
 1170 1175 1180
 Lys Val Asn Lys Gly Val Val Arg Val Gly Ile Asp Gln Thr Lys Gly
 1185 1190 1195 1200
 Leu Thr Thr Pro Lys Leu Thr Val Gly Asn Asn Asn Gly Lys Gly Ile
 1205 1210 1215
 Val Ile Asp Ser Gln Asn Gly Gln Asn Thr Ile Thr Gly Leu Ser Asn
 1220 1225 1230
 Thr Leu Ala Asn Val Thr Asn Asp Lys Gly Ser Val Arg Thr Thr Glu
 1235 1240 1245
 Gln Gly Asn Ile Ile Lys Asp Glu Asp Lys Thr Arg Ala Ala Ser Ile
 1250 1255 1260
 Val Asp Val Leu Ser Ala Gly Phe Asn Leu Gln Gly Asn Gly Glu Ala
 1265 1270 1275 1280
 Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asn Phe Ala Asp Gly Asn
 1285 1290 1295
 Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr Ser Lys Thr Ser Lys
 1300 1305 1310
 Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr Ile Glu Val Lys Asp
 1315 1320 1325
 Lys Lys Leu Gly Val Lys Thr Thr Thr Leu Thr Ser Thr Gly Thr Gly
 1330 1335 1340
 Ala Asn Lys Phe Ala Leu Ser Asn Gln Ala Thr Gly Asp Ala Leu Val
 1345 1350 1355 1360
 Lys Ala Ser Asp Ile Val Ala His Leu Asn Thr Leu Ser Gly Asp Ile
 1365 1370 1375
 Gln Thr Ala Lys Gly Ala Ser Gln Ala Asn Asn Ser Ala Gly Tyr Val
 1380 1385 1390
 Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser Thr Asp Asn Lys Tyr
 1395 1400 1405

Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp Lys Thr Lys Glu Val Ala
 1410 1415 1420
 Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro Asp Gly Thr Leu Ala
 1425 1430 1435 1440
 Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu Gln Val Asn Asp Ala
 1445 1450 1455
 Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala Phe Val Lys Gly Leu
 1460 1465 1470
 Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys Asn Ala Ala Val Thr Val
 1475 1480 1485
 Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu Thr Phe Ala Gly Asp
 1490 1495 1500
 Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu Thr Leu Thr Ile Lys Gly
 1505 1510 1515 1520
 Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn Asn Ile Gly Val Val
 1525 1530 1535
 Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala Lys Asp Leu Thr Asn
 1540 1545 1550
 Leu Asn Ser Val Asn Ala Gly Gly Thr Lys Ile Asp Asp Lys Gly Val
 1555 1560 1565
 Ser Phe Val Asp Ser Ser Gly Gln Ala Lys Ala Asn Thr Pro Val Leu
 1570 1575 1580
 Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Val Ile Ser Asn Val Gly
 1585 1590 1595 1600
 Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn Val Gln Gln Leu Asn Glu
 1605 1610 1615
 Val Arg Asn Leu Leu Gly Leu Gly Asn Ala Gly Asn Asp Asn Ala Asp
 1620 1625 1630
 Gly Asn Gln Val Asn Ile Ala Asp Ile Lys Lys Asp Pro Asn Ser Gly
 1635 1640 1645
 Ser Ser Ser Asn Arg Thr Val Ile Lys Ala Gly Thr Val Leu Gly Gly
 1650 1655 1660
 Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala Thr Gly Gly Ile Gln Val
 1665 1670 1675 1680
 Gly Val Asp Lys Asp Gly Asn Ala Asn Gly Asp Leu Ser Asn Val Trp
 1685 1690 1695
 Val Lys Thr Gln Lys Asp Gly Ser Lys Lys Ala Leu Leu Ala Thr Tyr
 1700 1705 1710
 Asn Ala Ala Gly Gln Thr Asn Tyr Leu Thr Asn Asn Pro Ala Glu Ala
 1715 1720 1725
 Ile Asp Arg Ile Asn Glu Gln Gly Ile Arg Phe Phe His Val Asn Asp
 1730 1735 1740
 Gly Asn Gln Glu Pro Val Val Gln Gly Arg Asn Gly Ile Asp Ser Ser

1745 1750 1755 1760
 Ala Ser Gly Lys His Ser Val Ala Ile Gly Phe Gln Ala Lys Ala Asp
 1765 1770 1775
 Gly Glu Ala Ala Val Ala Ile Gly Arg Gln Thr Gln Ala Gly Asn Gln
 1780 1785 1790
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 65              70              75              80

Asn Asp Asn Ala Ser Ala Ser Asn Glu Ala Ser Ile Ala Ile Gly Ser
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Leu Ala Lys Ala His Ala Asn Gln Ala Ile Ala Ile Gly Gly Ser Lys
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Pro Asp Pro Arg Asn Gln Ala Ala Asn Gln Lys Ala Gly Ser His Ala
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 35 40 45
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 Thr Arg Asp Glu Ile Gly Phe Thr Gly Thr Asn Gly Ser Leu Asp Lys
 65 70 75 80
 Ser Lys Pro His Leu Ser Lys Asp Gly Ile Asn Ala Gly Gly Lys Lys
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 Val Thr Gly Gly Lys Ile Tyr Asp Leu Lys Thr Glu Leu Glu Asn Lys
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 Arg Ala Ala Ser Ile Val Asp Val Leu Ser Ala Gly Phe Asn Leu Gln
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 Gly Asn Gly Glu Ala Val Asp Phe Val Ser Thr Tyr Asp Thr Val Asn
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 Phe Ala Asp Gly Asn Ala Thr Thr Ala Lys Val Thr Tyr Asp Asp Thr
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 Ser Lys Thr Ser Lys Val Val Tyr Asp Val Asn Val Asp Asp Thr Thr
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Ile Glu Val Lys Asp₃₂₅ Lys Lys Leu Gly Val₃₃₀ Lys Thr Thr Thr Leu Thr₃₃₅
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<212> DNA

<213> Moraxella catarrhalis

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<212> PRT

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 65 70 75 80
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 85 90 95
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 115 120 125
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 130 135 140
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 225 230 235 240
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 275 280 285
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 340 345 350

Gly Asp Ala Leu Val Lys Ala Ser Asp Ile Val Ala His Leu Asn Thr
 355 360 365
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 370 375 380
 Ser Ala Gly Tyr Val Asp Ala Asp Gly Asn Lys Val Ile Tyr Asp Ser
 385 390 395 400
 Thr Asp Asn Lys Tyr Tyr Gln Ala Lys Asn Asp Gly Thr Val Asp Lys
 405 410 415
 Thr Lys Glu Val Ala Lys Asp Lys Leu Val Ala Gln Ala Gln Thr Pro
 420 425 430
 Asp Gly Thr Leu Ala Gln Met Asn Val Lys Ser Val Ile Asn Lys Glu
 435 440 445
 Gln Val Asn Asp Ala Asn Lys Lys Gln Gly Ile Asn Glu Asp Asn Ala
 450 455 460
 Phe Val Lys Gly Leu Glu Lys Ala Ala Ser Asp Asn Lys Thr Lys Asn
 465 470 475 480
 Ala Ala Val Thr Val Gly Asp Leu Asn Ala Val Ala Gln Thr Pro Leu
 485 490 495
 Thr Phe Ala Gly Asp Thr Gly Thr Thr Ala Lys Lys Leu Gly Glu Thr
 500 505 510
 Leu Thr Ile Lys Gly Gly Gln Thr Asp Thr Asn Lys Leu Thr Asp Asn
 515 520 525
 Asn Ile Gly Val Val Ala Gly Thr Asp Gly Phe Thr Val Lys Leu Ala
 530 535 540
 Lys Asp Leu Thr Asn Leu Asn Ser Val Asn Ala Gly Gly Thr Lys Ile
 545 550 555 560
 Asp Asp Lys Gly Val Ser Phe Val Asp Ser Ser Gly Gln Ala Lys Ala
 565 570 575
 Asn Thr Pro Val Leu Ser Ala Asn Gly Leu Asp Leu Gly Gly Lys Val
 580 585 590
 Ile Ser Asn Val Gly Lys Gly Thr Lys Asp Thr Asp Ala Ala Asn Val
 595 600 605
 Gln Gln Leu Asn Glu Val Arg Asn Leu Leu Gly Leu Gly Asn Ala Gly
 610 615 620
 Asn Asp Asn Ala Asp Gly Asn Gln Val Asn Ile Ala Asp Ile Lys Lys
 625 630 635 640
 Asp Pro Asn Ser Gly Ser Ser Ser Asn Arg Thr Val Ile Lys Ala Gly
 645 650 655
 Thr Val Leu Gly Gly Lys Gly Asn Asn Asp Thr Glu Lys Leu Ala Thr
 660 665 670
 Gly Gly Ile Gln Val Gly Val Asp Lys Asp Gly Asn Ala Asn Gly Asp
 675 680 685
 Leu Ser Asn Val Trp Val Lys Thr Gln Lys Asp Gly Ser Lys Lys Ala

690		695		700
Leu 705	Leu Ala Thr Tyr	Asn 710	Ala Ala Gly Gln Thr	Asn 715 Tyr Leu Thr Asn 720
Asn	Pro Ala Glu 725	Ile Asp Arg Ile	Asn 730 Glu Gln Gly Ile	Arg 735 Phe
Phe	His Val 740	Asp Gly Asn Gln	Glu 745 Pro Val Val	Gln Gly Arg Asn 750
Gly Ile	Asp 755 Ser Ser Ala Ser	Gly 760 Lys His Ser	Val 765 Ala Ile Gly Phe	
Gln 770	Ala Lys Ala Asp Gly	Glu 775 Ala Ala Val	Ala 780 Ile Gly Arg Gln Thr	
Gln 785	Ala Gly Asn Gln	Ser 790 Ile Ala Ile	Gly Asp 795 Asn Ala Gln Ala Thr 800	
Gly Asp	Gln Ser 805	Ile Ala Ile Gly Thr	Gly 810 Asn Val Val Ala Gly Lys 815	

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 <211> 720
 <212> DNA
 <213> Moraxella catarrhalis

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 <212> PRT
 <213> Moraxella catarrhalis

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 Ile Ala Ala Leu Ala Val Leu Val Ile Gly Ala Thr
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<210> 51
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<212> PRT

<213> Moraxella cattarhalis

<400> 51

Val Val Ala Gly Lys
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